The paper is a valuable contribution of facts to the solution of questions of much interest, and M. Pictet's conclusions as to the causes of the results he describes are well worthy of the consideration that they will doubtless receive. It is to be presumed that he took all proper means to isolate the influences he applied from other influences, but his arguments would perhaps have gained in force if he had stated in detail what steps he had taken to ensure this isolation. For example, in his experiments on the colouring assumed by larvæ, though he is acquainted with the experiments of Prof. Poulton and others, showing the undoubted effect of a few coloured surroundings on the colouring of the larvæ of many species, it does not appear what precautions were taken to exclude the operation of such surroundings; nor in the experiments on the duration of the pupal stage when the larval "diapause" was shortened, or in the humidity experiments, does it appear that the temperatures during all the time of the pupal stage were noted; it is known that a very moderate difference in temperature will make a difference of many days in the duration of this period. One may venture to suggest, also, that in the continuation which it is hoped M. Pictet will make of his valuable experiments he will give as far as possible the whole number of the insects in the broods at their commencements and the whole number of perfect insects reared—in the great majority of cases only percentages are given; also that he will state whether the whole or nearly the whole of those reared were similar in appearance to those figured, and whether there was any considerable proportion substantially different.

There appears to be one error to which, as it has not the character of a mere slip, and therefore has a bearing on the arguments used, it is necessary to direct attention. The larvæ of the first generation of the year of *V. urticae* are at p. 94 mentioned as coming from butterflies which "have probably passed the winter in the chrysalis stage," and at p. 81 "certain Vanessas" are spoken of as being able to pass the winter in the egg, chrysalis, or winter stage. Surely *V. urticae* hibernates only as an imago, wherever there is a real winter, as is the habit of the Vanessas generally. Again, fifteen to twenty days is stated as the usual period of the larval life of *Argynnis paphia*; in England this hibernates as a very young larva, and feeds up, very quickly it is true, during April, May, and June, appearing as an imago in July or early August, and this is its usual habit on the continent of Europe.

F. MERRIFIELD.

CHEMISTRY IN THE SERVICE OF THE STATE.[1]

IN the year 1840, the Legislature made an interesting fiscal experiment. It repealed all previous enactments against the adulteration of tobacco, and permitted any ingredients, "except the leaves of trees, herbs, and plants," to be added to that article in the course of its preparation. The result was that tobacco speedily became grossly adulterated; in two years the consumption had decreased by more than a million pounds; and, since tobacco is a heavily taxed commodity, the Exchequer suffered severely. So serious a loss had to be promptly stopped; hence in 1842 the prohibition of adulteration was re-enacted. To help in making the prohibition effective, the Commissioners of Inland Revenue fitted up a small laboratory, the staff of which, consisting for some time of one person only, was occupied solely in detecting fraudulent additions to tobacco.

Such was the modest origin of the chief branch of the institution which now undertakes nearly all the analytical and consultative chemical work required by the various Government departments. Another branch, the Customs Laboratory, may be said to owe its inception chiefly to the Sale of Food and Drugs Act, 1875, which laid upon the Board of Customs the duty of supervising the quality of imported tea. The two branches were affiliated in 1894 under one head.

How considerable the business of the laboratory has now become may be gathered from the recently issued report of the principal chemist, describing the work of the department during the last financial year. From this it appears that the number of samples analysed in that period was no less than 138,508. Of these, 49,751 were examined in the Customs branch, and the remainder, 88,757, in the main laboratory at Clement's Inn Passage.

What, however, more particularly strikes one is the wide range of interests, both of the State and of the individual, which are touched at one point or another by the chemical activities of the department. We extract from the report a few notes which may serve to illustrate this, and to indicate the nature of the questions dealt with.

Dealing first with the Customs, the ultimate aim of the various analyses is, of course, to facilitate the just assessments of Customs dues. This, however, involves the testing of many articles which are not themselves dutiable. For instance, genuine cider is free of duty. A temptation is thus offered to an unscrupulous wine importer, since by labelling his wine as "cider" he may, if undetected, get it passed into the country without payment. As a matter of fact, out of 154 samples examined during the past year, 10 represented importations of so-called "cider" which was found to be chargeable as wine, and another had to pay duty as a spirit preparation. Again, crude methyl alcohol is admitted free, but if purified so as to be potable must pay the spirit duty. In 31 cases out of 256 the substance was, in fact, so pure that the full alcohol rate was levied.

As compared with the previous year, there has been a notable decrease in the number of certain beer, wine, and liqueur samples; this is attributed to diminished consumption of alcoholic beverages. On the other hand, samples of tea show a considerable increase—from 2345 to 3260—in spite of an augmented tea-duty. For various reasons, 316 of these specimens of tea were objected to, and 7 were condemned as unfit for human food.

Among other items of interest, we note that facilities are given by the Customs authorities for the utilising of waste tobacco in the preparation of sheep dips and similar articles. It appears that nicotine is supplanting arsenic as the active principle in such products.

The very high duty on saccharin—20*s*. per pound—involves, the principal chemist remarks, a careful outlook for this substance in the most unlikely places. 617 samples of articles which might have been vehicles for its fraudulent introduction were tested, and 55 of the number were charged the duty as being either saccharin or substances of like nature and use.

In the laboratory at Clement's Inn Passage, the business is classed as (1) Revenue work; (2) work for other Government departments; and (3) the analysis of samples referred by magistrates to the Government chemists in disputed cases under the Sale of Food and Drugs Acts. The examinations of excisable articles are devised to secure the revenue accruing from beer,

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[1] "Report of the Principal Chemist upon the Work of the Government Laboratory for the Year ending March 31, 1905" Official Publication, Cd. 2591. Price 3*d*.

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spirits, and tobacco. For instance, beer-duty is charged according to the specific gravity of the brewer's wort before fermentation, and this gravity is "declared" by the brewer himself. To test the accuracy of such declarations, 6370 samples of wort in various stages of fermentation were analysed, with the result that the amount of duty was increased in more than 10 per cent. of the cases. Again, on beer which is exported, "drawback" corresponding to the original duty can be claimed: to check the claims, samples of the beer are analysed; and during the year 2789 barrels were found to be not entitled to the drawback claimed. 813 samples of beer out of 6589 taken from publicans were shown by analysis to have been illegally diluted with water. Of so-called "temperance" drinks, about one-third of the whole number examined, 1011, contained alcohol in excess of the legal limit, the highest quantity being about as much as in ordinary light beer. Forty-four specimens of beer and brewing materials were found to contain arsenic in objectionable amount.

As regards spirits, it is noted that the exportation of medicinal tinctures, flavouring essences, and perfumes is increasing. So, too, is the use of denatured alcohol for industrial purposes, and of pure duty-free spirit issued to medical and other science schools.

Tobacco is examined chiefly to prevent an excessive admixture of water or oil; penalties were imposed in 87 cases of this kind during the past year, and also in other instances where glycerin and liquorice were unlawfully present.

Legal proceedings are necessarily a feature of the chemical control over dutiable articles. Penalties aggregating 5072*l.* were imposed during the year in respect of offences proof of which depended upon the analytical evidence.

Much work, of very varied scope, is carried out for the Admiralty, the Boards of Trade and Agriculture, India Office, Post Office, War Office, and other State departments. Imported dairy produce, for instance, is analysed for the Board of Agriculture in order to check the importation of adulterated foodstuffs; 2468 such articles were examined in the year, of which 2110 were butter and 305 milk and cream. Boron preservatives and artificial colouring-matter are found to be common additions to the butter. The use of the preservative is increasing; but, as the principal chemist points out, there is a difficulty in restricting the admixture so long as a legal limit has not been fixed. In two other respects it would seem that the law might well be amended. Butter, about the purity of which there were grave doubts, and cheese containing merely nominal amounts of fat, had, "in the absence of legal limits," to be admitted into the country without objection; this seems hardly fair, either to the home farmer or to the consumer.

In connection with the testing of filters, a useful note of warning is given to the makers of these articles. The actual filtering material may be quite satisfactory, but as regards giving a sterile filtrate the whole apparatus is sometimes rendered useless by leakage of unfiltered water through faulty fittings.

For the Home Office an interesting series of lead-glaze samples was examined during the year. It may be remembered that cases of lead poisoning in the pottery industry had a few years ago become so numerous as almost to constitute a public scandal. Profs. Thorpe and Oliver, who were commissioned by the Home Secretary to investigate the matter, recommended, among other remedial measures, the substitution of lead silicates for the white lead then in general use as a glazing substance, on the ground that the silicate, properly compounded, would be almost insoluble in the acids of the gastric juice, and therefore far less poisonous than the easily soluble white lead. Based on this recommendation, a regulation was framed by the Home Office; it was, however, thought by the potters to be too stringent, and eventually the point was submitted to arbitration, Lord James of Hereford being umpire. His award was in the nature of a compromise giving the manufacturers greater freedom than under the original proposal. The conditions are set forth in the report, together with the results of the analyses of samples of glaze showing how nearly the manufacturers, in the first year's working of the new rules, have been able to keep their glazes within the specified limits. On the whole, the results are fairly satisfactory. Thus thirty samples were represented as "leadless," and all but four did, in fact, conform to the regulation.

The India Office requires the analysis of a great variety of articles, which are examined in order to ensure that goods supplied by contractors are actually what they purport to be. Metals and alloys, cements, chemicals, disinfectants, drugs, food preparations, oils, paints, and surgical dressings were among the supplies sent for analysis during the year; but how far they proved to be satisfactory is not stated.

In cases which arise under the Sale of Food and Drugs Acts there may be a conflict of testimony, and the magistrate may wish to have before him independent evidence upon the chemical aspects of the question. In such matters the Government Laboratory acts as *amicus curiae,* and examines a sample of the article in dispute which has been specially reserved for that purpose. Further, whether the magistrate wants it or not, either of the litigants can claim to have this reserved sample forwarded for analysis. This is an excellent provision, securing as it does a careful examination of the disputed points by chemists unconnected with either prosecution or defence, and detached from any local influences which might, however wrongly, have been alleged or suspected by an accused person to have been used against him. During the past year this provision has been taken advantage of in 109 instances. The net result of the references was to support the allegation brought against the article in the great majority of cases, viz. in 95 out of 105.

The report bristles with matters of interest similar to the foregoing. It is the record of a useful year's work.

ON THE ORIGIN OF EOLITHS.

THE more detailed paper by M. Marcellin Boule on the subject of the origin of eoliths (see NATURE, August 31, p. 438) has now appeared in *l'Anthropologie* (Tome xvi., p. 257), and was briefly noticed in NATURE of September 28 (p. 538). The paper is too long for us, with the existing pressure upon our space, to give a full translation of it, but the following are the principal new features in the extended essay. The velocity of the circumference of the wheels in the *délayeurs,* or vats, is stated to be about 13 feet per second, the same as the speed of the Rhone in times of flood. It will therefore be seen that these mixing vats are of an entirely different character from ordinary pug-mills, and that the motion of the water in them may be properly described as torrential. The author attaches no importance to the fact that some of the blows to the flints are given by the iron teeth of the suspended harrows, and states that most of the flints are reduced to the condition of rolled pebbles, identical with those to be found in all flint gravels, but that there are numerous examples of *retouches,* or secondary working. In illustration of this he gives photographic figures of eleven different specimens by which he contends that

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